

California Air Resources Board

2006 ZEV Technology Review

**Sacramento, CA
September 27, 2006**

**Comments by Felix Kramer, Founder
The California Cars Initiative**



CalCars

THE CALIFORNIA CARS INITIATIVE

www.calcars.org

Prius PHEV Pioneers



Felix Kramer (right),
CalCars Founder, in '06,
world's first non-engineer
consumer PHEV owner

Ron Gremban, CalCars Tech
Lead, owner/ driver of world's
first PHEV Prius in '04



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What Does “100+MPG (+ Electricity)” Mean?



50.8 miles @124.1MPG = \$1.13 gasoline + \$0.71 electricity. Total: **\$1.84** or **3.6** cents/mile, compared to **\$2.79** or **5.5** cents/mile for Prius, **\$4.00-\$12.00** or **8-20** cents/mile for 35-12 MPG non-hybrids. We get **566 mi@130MPG** with most driving boosted and some all-electric trips.

*SMUD assumptions: \$2.75/gallon, \$0.102/kWh, 50 MPG Prius. When roll in "electric miles" to gasoline, **76 MPG equivalent**; at Felix's \$3.00 & \$.086, **83 MPG equivalent***



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Multiple and Evolving Reasons to Plug In

1. Saving money
2. Lower CO2
3. Energy independence
4. Silent driving
5. Avoid the pump
6. High-MPG "coolness"
(not a joke)

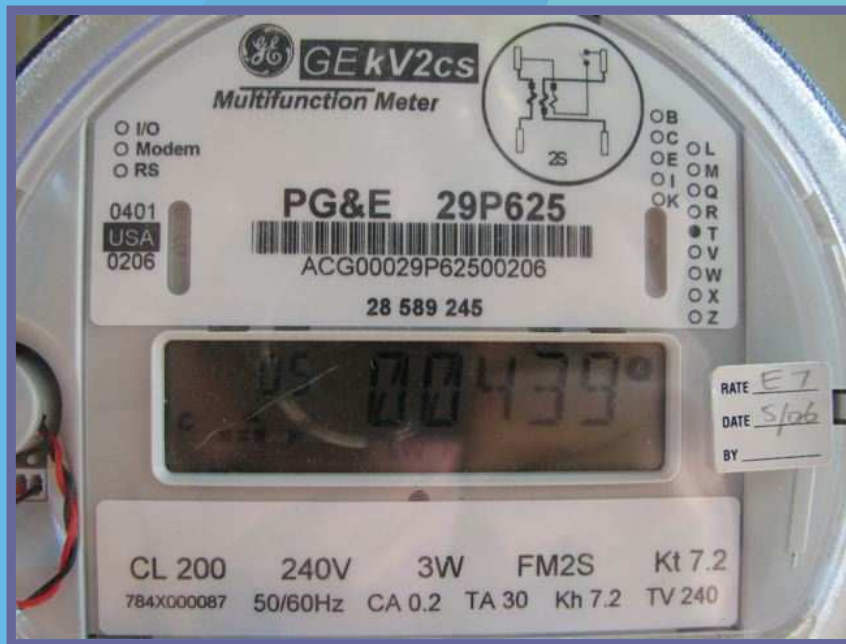


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Charging Calculus (after 9 Inconvenient Seconds)



- PG&E off-peak \$0.086/kwh = 2.2 cents/electric mile
- Summer on-peak \$0.293/kwh = 7.6c/e-mile
- Prius: 5.5 cents/mile
- "Opportunistic Charging" calls for rate-price signals at least for critical peaks



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Evolving to V2H (Vehicle-to-Home)



Phase 1: Standard grid-connected system (car charges from grid)

Phase 2: Islanded off-grid system ties in PHEV for extended outages; battery + engine = emergency power

Benefits:

- Cleaner/cheaper than emergency generator
- PHEV enables use & storage of renewable energy



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Growing Support and Optimistic Future Trends



Alan Greenspan, James Hansen, Senators Brownback/Clinton/Obama, Bill Ford, Bill Press, John Doerr



2004: What's a PHEV?

2005: Prove demand & pricing

2006: How/when can I get one?

Recent praise for PHEVs from: George Bush, Alan Greenspan, James Hansen, Senators Brownback/Clinton/Obama, Bill Ford, Bill Press, John Doerr

2007: Incentives; 3rd parties manage battery costs and risks

2008: Volume production extending existing lines

2009: Optimized PHEVs

2010: Movement toward PHEVs as default vehicle drivetrain



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**For more information:
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